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# Hybrid Logarithmic Percentage Change-Driven Objective Weighting and MOORA in Salesperson Performance Assessment

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**Abstract**−A salesperson is an individual who is responsible for selling a company's products or services to customers, either directly or through various marketing channels. The main problem in determining the best salesperson is often related to the complexity of assessing various aspects of performance comprehensively and fairly. While metrics such as sales volume are easy to measure, other important aspects such as the ability to build long-term relationships with customers, customer satisfaction, and contribution to team dynamics are more difficult to measure objectively. The purpose of this study was to combine LOPCOW and MOORA in the performance appraisal of salespeople. This study aims to address several challenges associated with the assessment of sales force performance, including heteroscedasticity in sales data and complexity in evaluating relevant multi-criteria criteria. By integrating LOPCOW to manage heteroscedasticity in sales data and MOORA to consider various aspects of sales force performance, resulting in a weighting method that can provide more accurate and comprehensive performance appraisals. The results of the salesperson performance ranking the 1st rank with the final value of MOORA 0.35861 with the name Salesperson HS, the 2nd rank with the final value of MOORA 0.34241 with the name Salesperson FT, and the 3rd rank with the final value of MOORA 0.3347 with the name Salesperson TS.

**Keywords**: Hybrid; LOPCOW; MOORA; Performance; Salesperson

## 1. INTRODUCTION

A salesperson is an individual who is responsible for selling a company's products or services to customers, either directly or through various marketing channels[1], [2]. They play a crucial role in influencing purchasing decisions by providing information, answering questions, and offering solutions that fit customer needs. In addition, salesperson are also tasked with building and maintaining good relationships with customers, which aims to create long-term loyalty and trust. Good communication skills, in-depth product knowledge, and effective negotiation skills are the keys to a salesperson's success in achieving sales targets and helping companies achieve sustainable business growth. In carrying out their duties, salesperson often face various challenges, including fierce competition, changing market needs, and increasingly high customer expectations. Therefore, they must continue to develop innovative sales skills and strategies. Their success is not only measured by how many products sell, but also by how well they can build long-term, profitable relationships between the company and customers. The performance of salesperson is an important indicator in measuring the success of a company's sales strategy. This performance can be assessed based on several key metrics, such as sales volume, conversion rate, customer retention, and customer satisfaction. High-performing salesperson usually have the ability to understand customer needs and preferences, and are able to offer the right solutions effectively and efficiently. In addition, they must also be proactive in finding new prospects, fostering good relationships with customers, and continuously improving their product knowledge. A deep understanding of the market and competition is also a critical success factor. Therefore, companies often provide continuous training and attractive incentives to encourage the improvement of salesperson's performance, so that they can make an optimal contribution to the growth and sustainability of the company's business. The main problem in determining the best salesperson is often related to the complexity of assessing various aspects of performance comprehensively and fairly. While metrics such as sales volume are easy to measure, other important aspects such as the ability to build long-term relationships with customers, customer satisfaction, and contribution to team dynamics are more difficult to measure objectively. Another difficulty arises in eliminating subjective opinion in evaluation, which can lead to dissatisfaction and demotivation among salesperson. Salesforce performance appraisal has a very high urgency in supporting the company's success. An accurate and fair scoring system plays an important role in optimizing sales strategies, increasing motivation, and retaining qualified sales people. Through proper assessment, companies can identify individual strengths and weaknesses, allowing for appropriate development and setting clear and realistic goals. In addition, effective performance appraisals also ensure that compensation and incentives are provided proportionately, which in turn increases motivation and productivity.

Decision Support System (DSS) is a computer-based system used to assist the decision-making process in an organization. DSS combines data, analytical models, and tools to make it easier for decision makers to analyze complex situations and make more informed decisions[3]–[5]. DSS is a very appropriate tool for solving problems because of its ability to process complex data and provide support in faster and more accurate decision-making. DSS facilitates the decision-making process by filtering, processing, and presenting relevant information in real-time, thereby minimizing risk and accelerating the determination of solutions.The system is designed to deal with semi-structured or unstructured

problems, where decisions cannot be fully automated and require human judgment. The main components of DSS include databases that store relevant information, mathematical and statistical models for analysis, and user interfaces that facilitate data interaction and visualization[6]–[8]. By providing relevant information and analyzing various decision alternatives, DSS helps decision makers to identify optimal solutions, reduce uncertainty, and improve efficiency and effectiveness in decision making. One of the methods in DSS is Multi-Objective Optimization on the basis of Ratio Analysis (MOORA). Multi-Objective Optimization on the basis of Ratio Analysis (MOORA) is a method used in multi-criteria decision making, where various objectives or criteria must be considered simultaneously to select the best alternative. This method converts criterion comparisons into ratio comparisons, allowing for a more objective evaluation. MOORA helps decision makers overcome the complexities of optimizing different objectives or criteria, making it a useful tool in a variety of contexts, from investment selection to the selection of the best product. One of the main advantages of the MOORA method is its ability to handle a large number of criteria or objectives simultaneously in the decision-making process[9]–[11]. This method allows decision makers to evaluate alternatives based on a variety of different aspects, from financial performance to environmental sustainability, in a structured and systematic way. MOORA is also relatively easy to implement and understand, as the concepts of ratio and comparison are relatively easy for users to understand. MOORA is more flexible in terms of the types of data that can be used, be it quantitative or qualitative data. One of the main drawbacks of the MOORA method lies in the uncertainty in the determination of weights for each criterion. This weighting is often a subjective process that involves preferences and judgments from decision makers. This can result in biased or inconsistent decisions, as different weights can produce different results. In addition, incorrect or improper determination of weights can lead to inaccurate assessment of alternatives. For example, if the weight for a criterion is too high or too low, it can lead to a disproportionate assessment of the alternatives evaluated. Therefore, the selection of the right weight requires a deep understanding of the problem at hand and the implications of each criterion on the decision to be taken. To overcome the weakness of MOORA in weighting criteria is proposed using Logarithmic Percentage Change-Driven Objective Weighting.

Logarithmic Percentage Change-Driven Objective Weighting (LOPCOW) is a methodology used to determine the relative importance of objectives in the decision-making process, especially in complex systems or projects[12]–[14]. This approach relies on analyzing logarithmic percentage changes of each goal over time or in various scenarios to assign weights accordingly. By considering the rate of change rather than absolute value, LOPCOW aims to capture the dynamic nature of goals and their impact on overall decision outcomes. This methodology provides a more refined and adaptive way of assigning weight to goals, allowing decision makers to prioritize areas that show significant changes or trends. Through LOPCOW, decision makers can better align their strategies with evolving conditions and optimize resource allocation to achieve desired outcomes effectively. In LOPCOW, each goal is judged not only by its absolute value, but also by how quickly the change occurs. This allows decision makers to be more responsive to the changing dynamics of the environment or market. The use of the LOPCOW weighting method to cover the weaknesses of the MOORA method in determining the weight of the criteria used.

Hybrid LOPCOW and MOORA are a combination of two different methods of decision-making analysis. LOPCOW is used to deal with heteroscedasticity in linear regression, while is used to select the best alternative in a multi-criteria situation. By integrating these two methods, decision makers can overcome some of the challenges that arise in complex decision analysis. The advantages of the Hybrid LOPCOW and MOORA Approach are first, by using LOPCOW, uncertainty in linear regression estimation can be minimized, so that the analysis results are more reliable. Second, MOORA allows decision makers to efficiently integrate various criteria or objectives in decision making, thus enabling a comprehensive evaluation of available alternatives. The combination of these two methods also helps overcome complexity in decision making by combining the strengths of statistical approaches and multi-criteria analysis. This approach can provide a robust and holistic framework to support effective and informed decision making.

Research related to salesperson performance was conducted by Nainggolan [15] The MOORA method is a method that has a level of flexibility and ease that can be understood in separating the subjective part of an evaluation into decision criteria and decision attributes in the best performance appraisal, then sales marketing will get a bonus from the company obtained alternative results A1 with a value of 0.4272 on behalf of Budian Arifin. Research conducted by Rahma [16] weighted product (WP) method to improve the quality of sales marketing receipt selection, the results showed that the use of the WP Method in SPK provides more objective and consistent results in sales marketing acceptance selection resulting in the highest value, namely as sales marketing is alternative 1 with the name Nur Aini. Research conducted by Citra [17] the purpose of this study is to determine the best sales performance by applying the GRA method and rank sum weighting in the assessment of existing sales performance, so that the results of the sales performance assessment will be a recommendation for the company in determining the best sales performance with the highest value of 0.1309 obtained by Hadi sales for rank 1. Research from Fadillah [18] TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution), which is a method that will look for the best alternative where the alternative has the closest distance from the ideal positive solution, the best sales selection system with the TOPSIS method can help improve the efficiency of determining the best sales. The difference with the research conducted in this study uses the LOPCOW weighting method for determining criteria and combining with the MOORA method the results of the criteria weights obtained.

The purpose of this study was to combine LOPCOW and MOORA in the performance appraisal of salespeople. This study aims to address several challenges associated with the assessment of sales force performance, including heteroscedasticity in sales data and complexity in evaluating relevant multi-criteria criteria. By integrating LOPCOW to manage heteroscedasticity in sales data and MOORA to consider various aspects of sales force performance, resulting in

a weighting method that can provide more accurate and comprehensive performance appraisals. The hybrid LOPCOW and MOORA offer tremendous benefits in multi-criteria decision making, especially in the areas of project management and performance evaluation. This method combines the power of LOPCOW, which assigns objective weighting based on logarithmic percentage changes, with MOORA's ability to optimize multiple goals simultaneously. Using this hybrid approach, decision makers can evaluate alternatives with more precision and objectivity, as each criterion is given a weight proportional to its actual impact. The result is more informative and data-driven decisions, which increase the efficiency and effectiveness of implemented strategies.

# 2. RESEARCH METHODOLOGY

## 2.1 Research Stages

Research stages are systematic steps taken in order to conduct scientific research to identify, analyze, and solve a problem or answer a particular question[19]–[21]. This stage aims to ensure that the research process is carried out in a structured, valid, and reliable manner. Each of these stages is interrelated and contributes to the entire research process, ensuring that the results obtained are accurate, reliable and relevant. Figure 1 is the stage of research conducted.

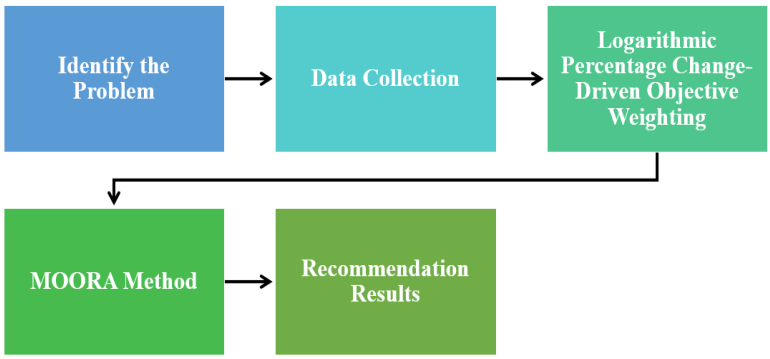


**Figure 1.** Research Stage

The stages of research figure 1 represent the research activities carried out, by following the stages of research made will produce a solution to existing problems. Problem identification in salesperson performance evaluation often involves a lack of clear and measurable key performance indicators (KPI), making it difficult to objectively assess individual contributions. One common problem in salesperson performance evaluation is the presence of subjective assumptions from the evaluator that can affect the appraisal results, resulting in inaccurate or unfair appraisals. The lack of relevant and accurate data to support performance evaluation can be a major problem, because without the right data, salesperson performance appraisals can be speculative and not based on facts. Problems in performance evaluation can arise from inconsistencies in the evaluation methods used, where frequent changes in appraisal criteria can confuse the salesperson and hinder performance improvement. The data collection process in a salesperson's performance evaluation begins with the identification of relevant KPIs, such as target achievement, communication skills, initiative and creativity, product knowledge, and teamwork. This data is then collected through various sources, such as daily or weekly sales reports, records of interactions with customers, and feedback from colleagues or customers. After the data is collected, analysis is carried out to evaluate the achievement of targets, identify patterns or trends, and develop future performance development plans. Ranking recommendations are essential for choosing the best alternative in a multi-criteria decision. The results of this ranking are based on pre-set criteria, where the alternative that has the best value for a particular criterion will get a higher ranking. Recommendations can assist decision makers in choosing alternatives that best suit their existing goals and preferences.

## 2.2 Logarithmic Percentage Change-Driven Objective Weighting

Logarithmic Percentage Change-Driven Objective Weighting (LOPCOW) is a method used in performance measurement or investment portfolio selection. This method prioritizes those assets that have a high logarithmic percentage change over time. The first stage of the LOPCOW method is to create a decision matrix, a decision matrix with equation (1).

$$X = \begin{bmatrix} x_{11} & x_{21} & x_{2n} \\ x_{12} & x_{22} & x_{2n} \\ x_{m1} & x_{m2} & x_{mn} \end{bmatrix} \quad (1)$$

The second stage of the LOPCOW method is matrix normalization, matrix normalization is the process of converting the values in the matrix into a uniform or relative scale calculated by equation (2).

$$n_{ij} = \frac{x_{ij}}{m+\sum_{i=1}^{m} {x_{ij}}^2} \quad (2)$$

The third stage of the LOPCOW method is preference value, preference value reflects how important a criterion or alternative is compared to others in the decision-making process. The preference value in LOPCOW is calculated by equation (3).

$$PV_{ij} = 100 * \left| \frac{\sqrt{\sum_{i=1}^{m} {n_{ij}}^2}}{\ln \frac{m}{\sigma}} \right| \quad (3)$$

The last stage of the LOPCOW method is the final weight, the final weight of the criteria is a value or score that describes the relative importance of each criterion in the decision matrix, this weight reflects how important each criterion is in decision making. The final weight in LOPCOW is calculated by equation (4).

$$w_j = \frac{PV_{ij}}{\sum_{j=1}^{n} PV_{ij}} \quad (4)$$

### 2.3 MOORA Method

Multi-Objective Optimization by Ratio Analysis (MOORA) is a method used in multi-objective decision making to evaluate and select the best alternative from a set of options involving multiple criteria. This approach incorporates ratio analysis to compare and sort alternatives based on their merit against a given range of goals. MOORA is used in situations where the goals to be achieved are of a conflicting nature, so it is important to find a solution that is the best compromise among all existing goals. This method has been applied in various fields such as management, engineering, finance, and other fields where complex decision making with consideration of many criteria is essential. MOORA provides a systematic and effective framework for understanding and resolving decision-making problems with multiple objectives. The first stage of MOORA is to create a decision matrix based on alternative assessment data using equation (1). The second stage of MOORA makes the normalization of the matrix using equation (5).

$$x_{ij}^{*} = \frac{x_{ij}}{\sqrt{\left[\sum_{i=1}^{j} x_{ij}^{2}\right]}} \quad (5)$$

The final stage of MOORA determines the value of the optimization criteria for each alternative using equation (6).

$$y_i = \sum_{j=1}^{n} w_j * x_{ij}^{*} - \sum_{j=g+1}^{n} w_j * x_{ij}^{*} \quad (6)$$

The application of MOORA not only allows decision makers to sort alternatives based on certain criteria, but also provides deep insight into trade-offs between different goals.

## 3. RESULT AND DISCUSSION

Salesperson performance appraisal for incentive provision, combining Hybrid Logarithmic Percentage Change-Driven Objective Weighting (LOPCOW) and MOORA (Multi-Objective Optimization by Ratio Analysis) Method can be an effective approach. LOPCOW can be used to give weight to various salesperson performance indicators, such as target achievement, communication skills, initiative and creativity, product knowledge, and teamwork. This method makes it possible to adjust the weight of criteria based on the degree of logarithmic change of performance indicators, taking into account not only absolute results but also the relative growth of the performance of the salesperson. Once weight is assigned, the MOORA Method can be used to rank salespersons based on predetermined criteria, so that management can determine fair and motivating incentives based on their relative performance. This hybrid approach can help improve objectivity and effectiveness in salesperson performance appraisals and incentive assignments.

### 3.1 Data Collection

Data collection in salesperson performance evaluation covers various aspects to ensure a comprehensive and objective assessment. With a structured and comprehensive approach to collecting and evaluating salesperson performance data, organizations can ensure that performance appraisals are conducted fairly, objectively, and data-driven. This will ultimately increase the motivation, productivity, and efficiency of the sales team, as well as support the achievement of overall business goals. Table 1 represents appraisal data in salesperson performance evaluation.

**Table 1.** Salesperson Performance Appraisal Data

| Salesperson Name | Target Achievement | Communication Skills | Initiative and Creativity | Product Knowledge | Teamwork |
|---|---|---|---|---|---|
| Salesperson AD | 8 | 8 | 8 | 8 | 7 |
| Salesperson GR | 9 | 7 | 8 | 9 | 8 |
| Salesperson FT | 8 | 8 | 9 | 8 | 9 |
| Salesperson HY | 7 | 9 | 9 | 9 | 7 |

| | | | | | |
|---|---|---|---|---|---|
| Salesperson FY | 8 | 8 | 8 | 9 | 8 |
| Salesperson BS | 6 | 7 | 9 | 8 | 7 |
| Salesperson DA | 7 | 9 | 9 | 8 | 8 |
| Salesperson TS | 8 | 8 | 8 | 8 | 9 |
| Salesperson HS | 9 | 9 | 9 | 9 | 8 |

Table 1 salesperson performance appraisal is a systematic and structured evaluation process to assess the effectiveness and contribution of a salesperson to the achievement of business goals obtained based on the collection of needs. The data collected in this assessment includes various performance metrics such as target achievement, communication skills, initiative and creativity, product knowledge, and teamwork. Performance appraisal of salespeople plays an important role in increasing productivity, optimizing resources, and achieving higher sales targets.

### 3.2 Determination of Criteria Weights Using the LOPCOW Method

Determination of criteria weighting using the LOPCOW (Logarithmic Percentage Change-Driven Objective Weighting) method involves several steps to ensure the resulting weights reflect logarithmic changes in performance data. The first stage of the LOPCOW method is to create a decision matrix, a decision matrix with equation (1).

$$X = \begin{bmatrix} 8 & 8 & 8 & 8 & 7 \\ 9 & 7 & 8 & 9 & 8 \\ 8 & 8 & 9 & 8 & 9 \\ 7 & 9 & 9 & 9 & 7 \\ 8 & 8 & 8 & 9 & 8 \\ 6 & 7 & 9 & 8 & 7 \\ 7 & 9 & 9 & 8 & 8 \\ 8 & 8 & 8 & 8 & 9 \\ 9 & 9 & 9 & 9 & 8 \end{bmatrix}$$

The second stage of the LOPCOW method is matrix normalization, matrix normalization is the process of converting the values in the matrix into a uniform or relative scale calculated by equation (2).

$$n_{11} = \frac{8}{9 + (8^2 + 9^2 + 8^2 + 7^2 + 8^2 + 6^2 + 7^2 + 8^2 + 9^2)} = \frac{8}{561} = 0.1141$$

Table 2 is the overall result of the calculation of matrix normalization values in the LOPCOW method.

**Table 2.** Calculation of Matrix Normalization Values in the LOPCOW Method

| Salesperson Name | Target Achievement | Communication Skills | Initiative and Creativity | Product Knowledge | Teamwork |
|---|---|---|---|---|---|
| Salesperson AD | 0.1141 | 0.1056 | 0.0955 | 0.0980 | 0.0854 |
| Salesperson GR | 0.1444 | 0.0809 | 0.0955 | 0.1240 | 0.1115 |
| Salesperson FT | 0.1141 | 0.1056 | 0.1209 | 0.0980 | 0.1411 |
| Salesperson HY | 0.0873 | 0.1337 | 0.1209 | 0.1240 | 0.0854 |
| Salesperson FY | 0.1141 | 0.1056 | 0.0955 | 0.1240 | 0.1115 |
| Salesperson BS | 0.0642 | 0.0809 | 0.1209 | 0.0980 | 0.0854 |
| Salesperson DA | 0.0873 | 0.1337 | 0.1209 | 0.0980 | 0.1115 |
| Salesperson TS | 0.1141 | 0.1056 | 0.0955 | 0.0980 | 0.1411 |
| Salesperson HS | 0.1444 | 0.1337 | 0.1209 | 0.1240 | 0.1115 |

The third stage of the LOPCOW method is preference value, preference value reflects how important a criterion or alternative is compared to others in the decision-making process. The preference value in LOPCOW is calculated by equation (3).

$$PV_1 = 100 * \left|\frac{0.3363}{3.286}\right| = 10.233$$

$$PV_2 = 100 * \left|\frac{0.3335}{3.295}\right| = 10.2003$$

$$PV_3 = 100 * \left|\frac{0.3310}{3.303}\right| = 10.023$$

$$PV_4 = 100 * \left|\frac{0.3310}{3.303}\right| = 10.023$$

$$PV_5 = 100 * \left|\frac{0.3338}{3.294}\right| = 10.131$$

The last stage of the LOPCOW method is the final weight, the final weight of the criteria is a value or score that describes the relative importance of each criterion in the decision matrix, this weight reflects how important each criterion is in decision making. The final weight in LOPCOW is calculated by equation (4).

$$w_1 = \frac{10.233}{10.233 + 10.2003 + 10.023 + 10.023 + 10.131} = 0.2025$$

$$w_2 = \frac{10.2003}{10.233 + 10.2003 + 10.023 + 10.023 + 10.131} = 0.2004$$

$$w_3 = \frac{10.023}{10.233 + 10.2003 + 10.023 + 10.023 + 10.131} = 0.1983$$

$$w_4 = \frac{10.023}{10.233 + 10.2003 + 10.023 + 10.023 + 10.131} = 0.1983$$

$$w_5 = \frac{10.131}{10.233 + 10.2003 + 10.023 + 10.023 + 10.131} = 0.2005$$

Figure 2 is the result of the overall weight of the criteria.

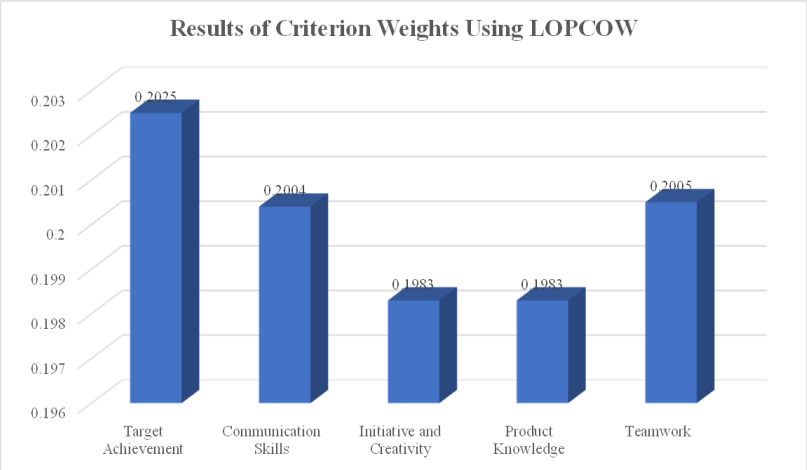


**Figure 2.** Result of Criterion Weight Using LOPCOW

The results of determining the weight of the figure 2 criteria show that the target achievement criteria have a weight of 0.2025, for communication skills criteria have a weight of 0.2004, for initiative criteria and for creativity criteria have a weight of 0.1983, for product knowledge criteria have a weight of 0.1983, and for teamwork criteria have a weight of 0.2005. This weight will be used in performance evaluation using the MOORA method.

### 3.3 Determination of Criteria Weights Using the LOPCOW Method

The MOORA (Multi-Objective Optimization by Ratio Analysis) method in sales force performance appraisal is an effective and comprehensive evaluation technique to optimize various appraisal objectives. Using MOORA, performance appraisals don't just focus on one single aspect, such as total sales, but also consider various other important factors. This method involves calculating ratios from various performance criteria, which are then combined to provide a composite score that reflects the overall performance of a salesperson. MOORA's advantage lies in its ability to address different objectives on every aspect of performance, resulting in fairer and more objective assessments. This helps companies identify the strengths and weaknesses of the sales force more accurately and formulate a more targeted development strategy. The first stage of MOORA is to create a decision matrix based on alternative assessment data using equation (1).

$$X = \begin{bmatrix} x_{11} & x_{21} & x_{31} & x_{41} & x_{51} \\ x_{12} & x_{22} & x_{32} & x_{42} & x_{52} \\ x_{13} & x_{23} & x_{33} & x_{43} & x_{53} \\ x_{14} & x_{24} & x_{34} & x_{44} & x_{54} \\ x_{15} & x_{25} & x_{35} & x_{45} & x_{55} \\ x_{16} & x_{26} & x_{36} & x_{46} & x_{56} \\ x_{17} & x_{27} & x_{37} & x_{47} & x_{57} \\ x_{18} & x_{28} & x_{38} & x_{48} & x_{58} \\ x_{19} & x_{29} & x_{39} & x_{49} & x_{59} \end{bmatrix}$$

The results of the assessment data decision matrix are as follows.

$$X = \begin{bmatrix} 8 & 8 & 8 & 8 & 7 \\ 9 & 7 & 8 & 9 & 8 \\ 8 & 8 & 9 & 8 & 9 \\ 7 & 9 & 9 & 9 & 7 \\ 8 & 8 & 8 & 9 & 8 \\ 6 & 7 & 9 & 8 & 7 \\ 7 & 9 & 9 & 8 & 8 \\ 8 & 8 & 8 & 8 & 9 \\ 9 & 9 & 9 & 9 & 8 \end{bmatrix}$$

The second stage of MOORA makes the normalization of the matrix using equation (5).

$$x_{11}^* = \frac{x_{11}}{\sqrt{x_{11}^2 + x_{12}^2 + x_{13}^2 + x_{14}^2 + x_{15}^2 + x_{16}^2 + x_{17}^2 + x_{18}^2 + x_{19}^2}}$$

$$x_{11}^* = \frac{8}{\sqrt{8^2 + 9^2 + 8^2 + 7^2 + 8^2 + 6^2 + 7^2 + 8^2 + 9^2}} = \frac{8}{23.494} = 0.3505$$

Table 3 is the overall result of the MOORA method normalization calculation.

**Table 3.** Calculation of Matrix Normalization Values in the MOORA Method

| Salesperson Name | Target Achievement | Communication Skills | Initiative and Creativity | Product Knowledge | Teamwork |
|---|---|---|---|---|---|
| Salesperson AD | 0.3405 | 0.3274 | 0.3112 | 0.3152 | 0.2945 |
| Salesperson GR | 0.3831 | 0.2865 | 0.3112 | 0.3546 | 0.3366 |
| Salesperson FT | 0.3405 | 0.3274 | 0.3501 | 0.3152 | 0.3786 |
| Salesperson HY | 0.2979 | 0.3683 | 0.3501 | 0.3546 | 0.2945 |
| Salesperson FY | 0.3405 | 0.3274 | 0.3112 | 0.3546 | 0.3366 |
| Salesperson BS | 0.2554 | 0.2865 | 0.3501 | 0.3152 | 0.2945 |
| Salesperson DA | 0.2979 | 0.3683 | 0.3501 | 0.3152 | 0.3366 |
| Salesperson TS | 0.3405 | 0.3274 | 0.3112 | 0.3152 | 0.3786 |
| Salesperson HS | 0.3831 | 0.3683 | 0.3501 | 0.3546 | 0.3366 |

The final stage of MOORA determines the value of the optimization criteria for each alternative using equation (6).

$$y_1 = (w_1 * x_{11}^*) + (w_2 * x_{21}^*) + (w_3 * x_{31}^*) + (w_4 * x_{41}^*) + (w_5 * x_{51}^*)$$

$$y_1 = (0.2025 * 0.3405) + (0.2004 * 0.3274) + (0.1983 * 0.3112) + (0.1983 * 0.3152) + (0.2005 * 0.2945)$$

$$y_1 = 0.06895 + 0.06561 + 0.06170 + 0.06251 + 0.05905$$

$$y_1 = 0.31783$$

$$y_2 = (w_1 * x_{12}^*) + (w_2 * x_{22}^*) + (w_3 * x_{32}^*) + (w_4 * x_{42}^*) + (w_5 * x_{52}^*)$$

$$y_2 = (0.2025 * 0.3831) + (0.2004 * 0.2865) + (0.1983 * 0.3112) + (0.1983 * 0.3546) + (0.2005 * 0.3366)$$

$$y_2 = 0.07757 + 0.05741 + 0.0617 + 0.07033 + 0.06748$$

$$y_2 = 0.3345$$

$$y_3 = (w_1 * x_{13}^*) + (w_2 * x_{23}^*) + (w_3 * x_{33}^*) + (w_4 * x_{43}^*) + (w_5 * x_{53}^*)$$

$$y_3 = (0.2025 * 0.3405) + (0.2004 * 0.3274) + (0.1983 * 0.3501) + (0.1983 * 0.3152) + (0.2005 * 0.3786)$$

$$y_3 = 0.06895 + 0.06561 + 0.06942 + 0.06251 + 0.07592$$

$$y_3 = 0.32421$$

$$y_4 = (w_1 * x_{14}^*) + (w_2 * x_{24}^*) + (w_3 * x_{34}^*) + (w_4 * x_{44}^*) + (w_5 * x_{54}^*)$$

$$y_4 = (0.2025 * 0.2979) + (0.2004 * 0.3683) + (0.1983 * 0.3501) + (0.1983 * 0.3546) + (0.2005 * 0.2945)$$

$$y_4 = 0.06033 + 0.07382 + 0.06942 + 0.07033 + 0.05905$$

$$y_4 = 0.33294$$

$$y_5 = (w_1 * x_{15}^*) + (w_2 * x_{25}^*) + (w_3 * x_{35}^*) + (w_4 * x_{45}^*) + (w_5 * x_{55}^*)$$

$$y_5 = (0.2025 * 0.3405) + (0.2004 * 0.3274) + (0.1983 * 0.3112) + (0.1983 * 0.3546) + (0.2005 * 0.3366)$$

$$y_5 = 0.06895 + 0.06561 + 0.0617 + 0.07033 + 0.06748$$

$$y_5 = 0.33408$$

$$y_6 = (w_1 * x^*_{16}) + (w_2 * x^*_{26}) + (w_3 * x^*_{36}) + (w_4 * x^*_{46}) + (w_5 * x^*_{56})$$

$$y_6 = (0.2025 * 0.2554) + (0.2004 * 0.2865) + (0.1983 * 0.3501) + (0.1983 * 0.3152) + (0.2005 * 0.2945)$$

$$y_6 = 0.05171 + 0.05741 + 0.06942 + 0.06251 + 0.05905$$

$$y_6 = 0.3001$$

$$y_7 = (w_1 * x^*_{17}) + (w_2 * x^*_{27}) + (w_3 * x^*_{37}) + (w_4 * x^*_{47}) + (w_5 * x^*_{57})$$

$$y_7 = (0.2025 * 0.2979) + (0.2004 * 0.3683) + (0.1983 * 0.3501) + (0.1983 * 0.3152) + (0.2005 * 0.3366)$$

$$y_7 = 0.06033 + 0.07382 + 0.06942 + 0.06251 + 0.06748$$

$$y_7 = 0.33356$$

$$y_8 = (w_1 * x^*_{18}) + (w_2 * x^*_{28}) + (w_3 * x^*_{38}) + (w_4 * x^*_{48}) + (w_5 * x^*_{58})$$

$$y_8 = (0.2025 * 0.3405) + (0.2004 * 0.3247) + (0.1983 * 0.3112) + (0.1983 * 0.3152) + (0.2005 * 0.3786)$$

$$y_8 = 0.06895 + 0.06561 + 0.0617 + 0.06251 + 0.07592$$

$$y_8 = 0.3347$$

$$y_9 = (w_1 * x^*_{19}) + (w_2 * x^*_{29}) + (w_3 * x^*_{39}) + (w_4 * x^*_{49}) + (w_5 * x^*_{59})$$

$$y_9 = (0.2025 * 0.3831) + (0.2004 * 0.3683) + (0.1983 * 0.3501) + (0.1983 * 0.3546) + (0.2005 * 0.3366)$$

$$y_9 = 0.07757 + 0.07382 + 0.06942 + 0.07033 + 0.06748$$

$$y_9 = 0.35861$$

The final result of the MOORA optimization value is the overall result of the salesperson performance appraisal.

### 3.4 Recommendation Result

The results of the performance appraisal using a hybrid approach of LOPCOW and MOORA by implementing strategic measures to improve the performance of the sales force. By implementing these recommendations, companies can leverage ranking results to improve weaknesses, maximize strengths, and overall increase productivity and sales force satisfaction. Figure 3 is the result of ranking the performance of the salesperson.

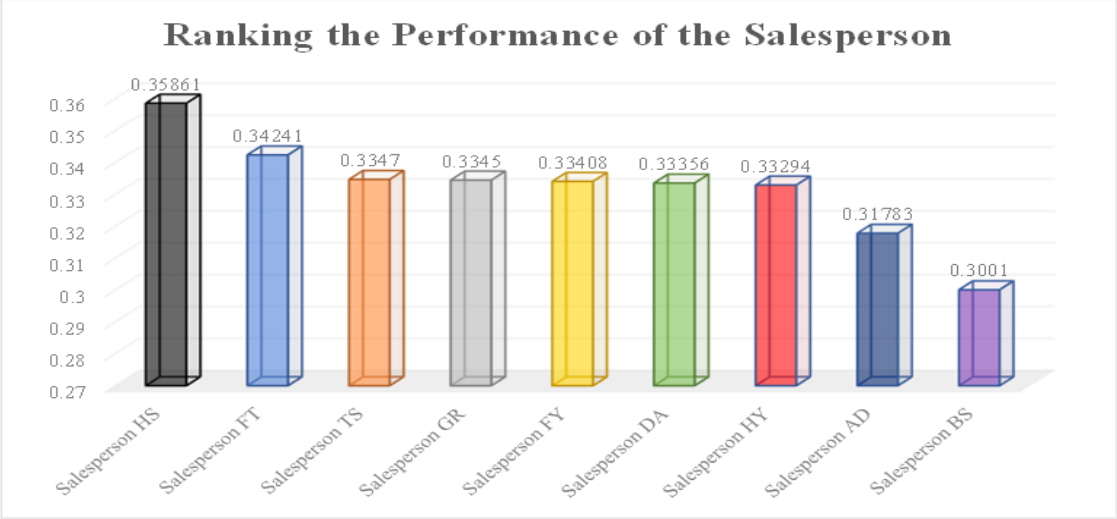


**Figure 3.** Ranking the Performance of the Salesperson

The results of the salesperson performance ranking figure 1 show the 1st rank with the final value of MOORA 0.35861 with the name Salesperson HS, the 2nd rank with the final value of MOORA 0.34241 with the name Salesperson FT, the 3rd rank with the final value of MOORA 0.3347 with the name Salesperson TS, the 4th rank with the final value of MOORA 0.3345 with the name Salesperson GR, the 5th rank with the final value of MOORA 0.33408 with the name Salesperson FY, the 6th rank with MOORA final value 0.33356 with the name Salesperson DA, the 7th rank with MOORA final value 0.33294 with the name Salesperson HY, the 8th rank with MOORA final value 0.31783 with the name Salesperson AD, and the 9th rank with MOORA final value 0.3001 with the name Salesperson BS.

# 4. CONCLUSION

Hybrid LOPCOW and MOORA are a combination of two different methods of decision-making analysis. LOPCOW is used to deal with heteroscedasticity in linear regression, while is used to select the best alternative in a multi-criteria situation. By integrating these two methods, decision makers can overcome some of the challenges that arise in complex decision analysis. The advantages of the Hybrid LOPCOW and MOORA Approach are first, by using LOPCOW, uncertainty in linear regression estimation can be minimized, so that the analysis results are more reliable. Second, MOORA allows decision makers to efficiently integrate various criteria or objectives in decision making, thus enabling a comprehensive evaluation of available alternatives. The combination of these two methods also helps overcome complexity in decision making by combining the strengths of statistical approaches and multi-criteria analysis. This approach can provide a robust and holistic framework to support effective and informed decision making. The results of the salesperson performance ranking the 1st rank with the final value of MOORA 0.35861 with the name Salesperson HS, the 2nd rank with the final value of MOORA 0.34241 with the name Salesperson FT, and the 3rd rank with the final value of MOORA 0.3347 with the name Salesperson TS. The limitations in this study lie in the complexity of the model which may require a deep understanding and special expertise to be applied effectively, as well as the potential difficulty in generalizing the results in different contexts.

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